Embedding a Web-Browser in an Order Entry System to Improve the Distributed Maintenance of Decision-Support Resources

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Background. One of the key features of WizOrder [1], a care provider order entry system developed at Vanderbilt University Medical Center (VUMC), is to support the distributed maintenance of decision-support resources while making them easily accessible to the users.

Two methods have been used to make sure that experts own and maintain the relevant knowledge bases: a) define standard data formats and procedures so that WizOrder can automatically import databases from the ancillary systems where they are maintained. For example, pharmacists have built, in the pharmacy computer, an extensive set of databases about drug interactions, drug doses, drug monographs, and information for patients; b) build user interfaces that allow experts to capture and maintain knowledge in the WizOrder system by direct interaction. Oncology attendings have built and maintain more than 100 chemotherapy protocols. 700 diagnostic- or procedure-specific order sets, protocols, and decision-trees are currently available.

With the extension of the decision-support capabilities of the order entry system, and the involvement of an increasingly diverse set of experts, it has become difficult to support the synchronization of available resources using the mechanisms described above. This is particularly true in highly specialized areas in which the effort is not amortized over large volumes of data.

Showing the right information at the right time represents a significant portion of decision-support capabilities. Thus, it seemed logical to investigate how HTML, a standardized document representation language with built-in support for distributed systems could help solve these scalability issues.

Methods. Using a set of APIs available in the OS/2 operating system and derived from the WebExplorer® Web-browser, we have built into the WizOrder client a simple browser that supports the rendering of HTML documents and hypertext navigation. By design, we have limited navigation to the hypertext links explicitly provided by the HTML document itself, with the exception of the 'home" function. Documents can also be printed.

The initial interaction is controlled by the WizOrder server, which can invoke the browser in two ways: by specifying the name and location (URL) of the document to be displayed or by building a page on the fly and sending it to the client.

To allow for the browsing and navigation to result in an action by the order entry system, we implemented the wizorder scheme:

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<A HREF="wizorder:command">...</A>
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where command is one of the WizOrder commands, such as displaying a specific order set, ordering a medication, or initiating a specific decision-support tool.

Results. The example of the ordering of restraint devices illustrates the advantages of this approach. Policies and procedures are defined by the hospital administration; order sets and protocols are maintained by nursing services; specific information about developmental assessment is provided by pediatrics; and training material is developed by the education services. Each of these services maintain and publish HTML documents or URLs to their own Web servers. These links are grouped in a 'home" page, which is displayed when restraints are ordered and can in turn activate appropriate orders or protocols.

Likewise, when a drug interaction or an inappropriate drug dose is detected by the order entry system, an HTML document is created on the fly and provides links to various information sources, including a concise monograph, an extended monograph, and the ability to browse the pharmacy formulary and interaction database.

This new feature was well accepted by the users, as the hypertext navigation paradigm is both intuitive and widely used.

References

1. Geissbühler A, Miller RA. A New Approach to the Implementation of Direct Care-Provider Order Entry. Proc AMIA Fall Symp, 1996; 689-693